

No.

8200065



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Fred K. Suzuki and Robert H. Dobberstein

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT (S-I), THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT 1942, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

STEVIA

'P. J. Suzuki'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington this 28th day of October in the year of our Lord one thousand nine hundred and eighty-two.

Attest

Kenneth H. Block
Acting

Commissioner
Plant Variety Protection Office
Grain Division
Agricultural Marketing Service

John R. Block
Secretary of Agriculture

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION

FORM APPROVED
OMB NO. 40-R3822

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

INSTRUCTIONS: See Reverse.

No certificate for plant variety protection may be issued unless a completed application form has been received (5 U.S.C. 553).

1a. TEMPORARY DESIGNATION OF VARIETY (PJS-1)		1b. VARIETY NAME var. P. J. Suzuki		FOR OFFICIAL USE ONLY PV NUMBER 8200065	
2. KIND NAME Stevia		3. GENUS AND SPECIES NAME Stevia rebaudiana Bertoni		FILING DATE 2/2/82	TIME 2:00 P.M.
4. FAMILY NAME (BOTANICAL) Compositae		5. DATE OF DETERMINATION March 17, 1980		FEE RECEIVED \$ 500.00 \$ 250.00	DATE 2/2/82 8/16/82
6. NAME OF APPLICANT(S) Fred K. Suzuki and Robert H. Dobberstein		7. ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code) 746 West Algonquin Road Arlington Heights, Illinois 60005		8. TELEPHONE AREA CODE AND NUMBER (312) 593-0226	
9. IF THE NAMED APPLICANT IS NOT A PERSON, FORM OF ORGANIZATION: (Corporation, partnership, association, etc.) NA		10. IF INCORPORATED, GIVE STATE AND DATE OF INCORPORATION NA		11. DATE OF INCORPORATION NA	

12. NAME AND MAILING ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS:

Tom F. Pruitt, Attorney-at-Law;
c/o Dr. Robert H. Dobberstein
746 West Algonquin Road, Arlington Heights, Illinois 60005

13. CHECK BOX BELOW FOR EACH ATTACHMENT SUBMITTED:

- ☒ 13A. Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)
- ☐ 13B. Exhibit B, Novelty Statement.
- ☒ 13C. Exhibit C, Objective Description of the Variety (Request form from Plant Variety Protection Office.)
- ☒ 13D. Exhibit D, Additional Description of the Variety.

14a. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a). (If "Yes," answer 14B and 14C below.) ☐ YES ☐ NO SEEDS NOT TO BE SOLD

14b. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? ☐ YES ☐ NO

14c. IF "YES," TO 14B, HOW MANY GENERATIONS OF PRODUCTION BEYOND BREEDER SEED? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

15a. DID THE APPLICANT(S) FILE FOR PROTECTION OF THIS VARIETY IN OTHER COUNTRIES? ☐ YES ☒ NO (If "Yes," give name of countries and dates.)

15b. HAVE RIGHTS BEEN GRANTED THIS VARIETY IN OTHER COUNTRIES? ☐ YES ☒ NO (If "Yes," give name of countries and dates.)

16. DOES THE APPLICANT(S) AGREE TO THE PUBLICATION OF HIS/HER (THEIR) NAME(S) AND ADDRESS IN THE OFFICIAL JOURNAL? ☐ YES ☐ NO

17. The applicant(s) declare(s) that a viable sample of basic seed of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

1/26/82
(DATE)

1/26/82
(DATE)

Fred K. Suzuki
(SIGNATURE OF APPLICANT)
Fred K. Suzuki

Robert H. Dobberstein
(SIGNATURE OF APPLICANT)
Robert H. Dobberstein

ORIGIN AND BREEDING HISTORY OF *Stevia rebaudiana* Bert. var. P. J. Suzuki

The roots and seeds of *Stevia rebaudiana* Bert. used by applicants to develop the P. J. Suzuki strain were obtained (Morita Kagaku Kogyo Co., Ltd., Osaka, Japan) from plants growing in Hokkaido, Japan.

Root cuttings from three-year-old plants were shipped to the United States in January, 1974. The roots were planted in clay pots and stored in a cold-frame for one week, after which they were transferred to a greenhouse. Visible growth was apparent in February and growth was luxuriant by April. One hundred ten plants survived (ca.50%). In September 1974, root divisions were made to obtain additional plants with which to work. These root divisions yielded a total of approximately 485 plants. Seeds were collected from these plants in late September, but viability was poor (1-2%). After seed harvest, the plants were exposed to 14-hour day length by use of supplemental lighting with Gro-Light fluorescent bulbs. In October 1974, stem cuttings were made to yield an additional 1621 plants. These cuttings were made only to obtain additional plants for experimentation and were not part of the selection process.

Less than 2% of the seeds originally shipped from Hokkaido were viable. A second lot of seeds from the same source were germinated in Jiffy peat pots in February 1975, and grown in the greenhouse. Viability was still poor (approximately 18.5%).

In June 1975, 486 plants grown from the original root and stem cuttings were transplanted by hand into a field. At the same time 1500 plantlets from the seed germinated in February were transplanted by a mechanical transplanter into the field. Plants were irrigated as needed (1-4 times per month). Seeds (6.83 pounds) were collected from these field plants in September 1975.

All of this seed was germinated in Jiffy peat pots in an environmentally-controlled greenhouse at 24°C. Jiffy pots were placed in trays and incubated on electrically heated, thermostatically controlled, propagation mats controlled at 33°C. Viability of this seed was 47-53%. When two true leaves had formed on most of the seedlings (approximately 2 weeks), the planting trays were removed and the greenhouse temperature was reduced to 21°C day temperature (14 hours) and 18°C night temperature (10 hours). Plant growth was poor at these low temperatures and only 42% of the plantlets survived. After 5 months the greenhouse temperature was raised to 24°C (day and night).

In September 1977, 15,000 roots of the plants (*vide supra*) were packed in moist sphagnum moss and shipped to the Company propagation site in California, where they were planted in the field. During the winters of 1977 to 1980, frost and flooding reduced the number of field plants by 25%. These plants were replaced by plants grown from stem cuttings of the field plants which survived. From 1979 to the present, the field plants served as a plant source for continued selection, as a continual source of seed of the described strain, and to obtain evidence of uniformity and stability. The variety has thus been proven to be stable and uniform.

SUMMARY OF ORIGIN AND HISTORY OF *Stevia rebaudiana* var P. J. Suzuki

Roots (Hokkaido, Japan)

cold-frame
then
greenhouse1
110 plants
↓
root division486 plants
↓
stem cuttings

1621 plants

500 plants

Seed (Hokkaido, Japan)

germinate
in
greenhouse1
2500 plantlets

1500 plants

field planting

2000 plants

seed (6 lbs)

germinate
grow at selection conditions:
1. low temperature
2. moderate temperature

15,000 plants (greenhouse)

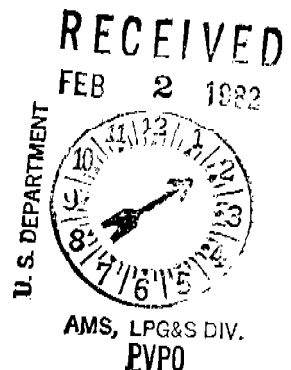
remove roots
ship to Propagation Center
plant in field15,000 plants (field) = serve as seed source
for strain

INSTRUCTIONS

GENERAL: Send an original copy of the application and exhibits, at least 2,500 viable seeds, and \$500 fee (\$250 filing fee and \$250 examination fee) to U.S. Dept. of Agriculture, Agricultural Marketing Service, Livestock, Poultry, Grain and Seed Division, Plant Variety Protection Office, National Agricultural Library Building, Beltsville, Maryland 20705. (See section 180.175 of the Regulations and Rules of Practice.) Retain one copy for your files. All items on the face of the form are self-explanatory unless noted below.

ITEM

- 5 Give the date the applicant determined that he had a new variety based on (1) the definition in section 41(a) of the Act and (2) the date a decision was made to increase the seed,
- 13a Give: (1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method; (2) the details of subsequent stages of selection and multiplication; (3) the type and frequency of variants during reproduction and multiplication **and** state how these variants may be identified and (4) evidence of uniformity and stability.
- 13b Give a summary statement of the variety's novelty. Clearly state how this novel variety may be distinguished from all other varieties in the same crop. If the new variety most closely resembles one or a group of related varieties: (1) identify these varieties and state all differences objectively; (2) attach statistical data for characters expressed numerically and demonstrate that these differences are significant; and (3) submit, if helpful, seed and plant specimens or photographs of seed and plant comparisons clearly indicating novelty.
- 13c Fill in the Exhibit C, Objective Description form, for all characteristics for which you have adequate data.
- 13d Describe any additional characteristics that are not described, or whose description cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the description of characteristics that are difficult to describe, such as, plant habit, plant color, disease resistance, etc.
- 14a If "YES" is specified (seed of this variety be sold by variety name only as a class of certified seed) the applicant may NOT reverse his affirmative decision after the variety **has either** been sold and so labeled, his decision published, or the certificate has been issued. However, if the applicant specified "NO," he may change his choice. (See section 180.16 of the Regulations and Rules of Practice.)
- 15a See section 42 of the Plant Variety Protection Act and section 180.7 of the Regulations and Rules of Practice.



Mr. Joseph J. Higgins
 April 7, 1982
 Page 3

DITERPENE	GLYCOSIDE	<u>S. rebaudiana</u>		<u>S. rebaudiana</u>
		<u>"Wild Type"</u>		<u>Var. P. J. Suzuki</u>
Steviolbioside		0.04%		0.01-1%
Stevioside		2-10%		5-12%
Rebaudioside	A	0.23-2.9%		3.7-6.9%
Rebaudioside	B	0.04-0.07%		Less than 0.2%*
Rebaudioside	C	0.4%		0.5-1.5%
Rebaudioside	D	0.03%		Less than 0.2%"
Rebaudioside	E	0.03%		Less than 0.2%*
Dulcoside	A	0.19%		0.1-0.5%

The ordinate scale in Figure 2 is absorbance (optical density); the abscissa is time. Peak #3 is off-scale in Figure 2A but on scale in Figure 2B. The concentrations represented by the peaks are: Fig. 2A - peak 3 (stevioside), 43.10 µg (8.62% of dry leaves weight); peak 5 (rebaudioside A), 11.26 µg (2.25% of dry leaves weight). Figure 2B - peak 3, 30.15 µg (6.03% of dry leaves weight), peak 5, 24.14 µg (4.83% of dry leaves weight).

Table 2, "Exposure of *Stevia rebaudiana* var. P. J. Suzuki to adverse environmental conditions" was not a planned experiment. It represents field plants which were exposed to natural environmental changes. *S. rebaudiana* roots ("wild type") obtained from Hokkaido were propagated by root division and stem cuttings (Exhibit A, page 1). When plants from this source were grown in the field and exposed to similar natural environmental changes, their survival rate was 0%, compared to a survival rate of 85% for the P. J. Suzuki variety.

I have finally located references 21-47 as cited in our reference #19 and have enclosed them. I apologize for their inadvertent omission in our original application.

We have completed the enclosed sunflower form to the best of our ability. However, some questions, such as "length of internode at harvest ripeness", and "number of leaves" are virtually impossible to answer since the plant is a perennial shrub which grows larger each year, and since the plant (and leaf) size is dependent on sunlight intensity and day length. In our experience, the morphological characteristics of the "wild-type" and the P. J. Suzuki variety are virtually indistinguishable. The only difference which we have observed is that the P. J. Suzuki variety plants grown in the same field show less plant to plant variation than do the wild type.

*Concentrations were too low to accurately quantitate by the hplc methodology employed.

EXHIBIT B

NOVELTY -STATEMENT

Stevia rebaudiana Bert. var. P. J. Suzuki differs from other varieties of *Stevia rebaudiana* in:

- a. having a seed viability in excess of twenty-five percent (25%);
- b. having a rebaudioside A content in excess of three percent (3%) of dry leaf weight; and
- c. having a capability to survive after exposure to temperatures below 32° F for more than three (3) hours.

SUPPORTING INFORMATION

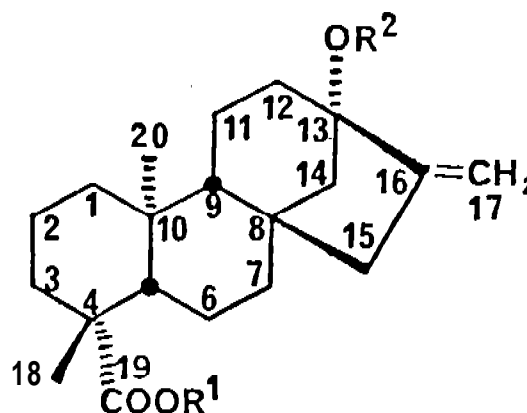
1. Historical Background

Stevia rebaudiana Bert is a wild shrub indigenous to Paraguay and possibly some contiguous areas in Brazil and Argentina (1). Although the plant was initially designated *Eupatorium rebaudianum* (2), it was later reclassified in the genus *Stevia* and renamed *Stevia rebaudiana* Bert. (3).

The sweet properties of this plant were first described scientifically in 1908 (4). The first sweet-tasting, pure, crystalline compound, stevioside, was isolated by Bride1 and Lavieille in 1931 (5-8). However, the complete chemical structure of stevioside was not elucidated until 1963 (9-16). Although early work suggested that stevioside was non-toxic (17), the plant has not been propagated on a large commercial scale for use as a sweetener because the seeds were largely sterile, such that reproduction by root cuttings was necessary (1, 10, 18, 19). This method of reproducing plants is both laborious and costly. In addition, the quantity of plants growing wild in Paraguay is not abundant (1). Although stevioside is being used as a sweetener in Japan today, its use is severely limited due to the paucity of high quality *S. rebaudiana* plant material available throughout the world.

To date, eight sweet diterpene glycosides have been isolated from *S. rebaudiana*. The names, chemical structures, and plant yields of these compounds are shown in Table 1.

8200065



COMPOUND	RELATIVE SWEETNESS	R ₁	R ₂	YIELD ¹ (REFERENCE)
Steviol bioside	0.43	-H	-H	0.04% (20)
Stevioside	1.00	-H	-G ² -- ¹ G	2-10% (1, 21)
Rebaudioside A	1.50	-G	-G ² -- ¹ G ₃	0.23-2.9% (20-23) ²
			¹ G	
Rebaudioside B	<1.50	-H	-G ² -- ¹ G ₃	0.04-0.07% (20, 24)
			¹ G	
Rebaudioside C (Dulcoside B)	0.10	-G	-G ² -- ¹ Rh	0.4% (25)
			¹ G	
Rebaudioside D	1.0-1.25	-G ² -- ¹ G	-G ² -- ¹ G ₃	0.03% (25)
			¹ G	
Rebaudioside E	1.00	-G ² -- ¹ G	-G ² -- ¹ G	0.03% (25)
Dulcoside A	0.25	-G	-G ² -- ¹ Rh	0.19% (26)

G = B-D-glucopyranosyl

Rh = α-L-rhamnopyranosyl

¹Yield = percent of dry weight of leaves²This is the concentration of rebaudioside A in the original varieties of *S. rebaudiana*. The P. J. Suzuki variety produces significantly larger amounts of rebaudioside A.

2. Discussion of Novelty

Stevia rebaudiana Bert. var. P. J. Suzuki is not anatomically distinct from the wild parent strain, although there is considerably less plant-to-plant variation in the appearance of the former strain.

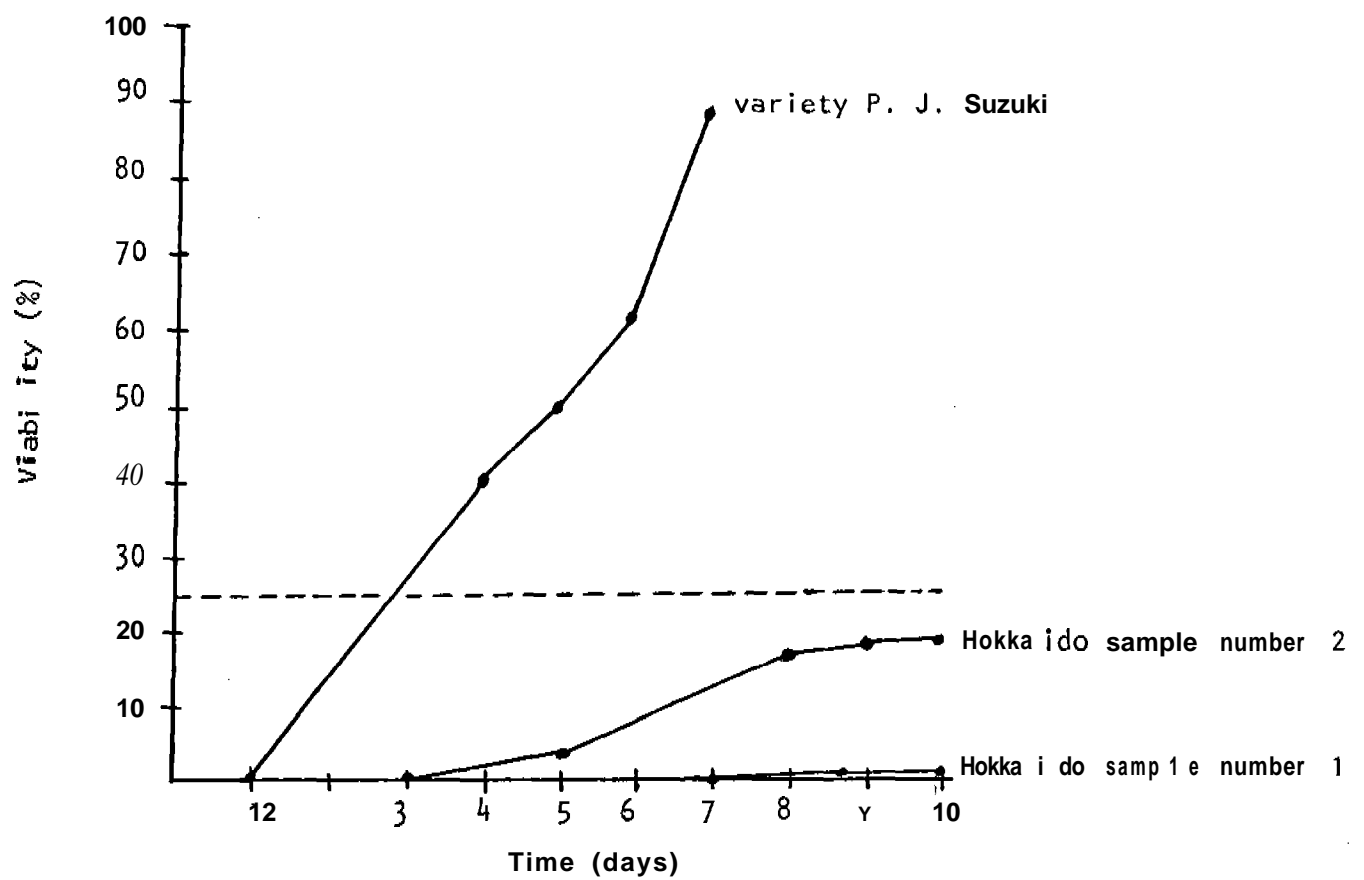
The P. J. Suzuki strain is novel in three respects, seed viability, rebaudioside A content, and frost/flood resistance.

Seed Viability

As previously described, earlier strains of *S. rebaudiana* produced seeds which were largely sterile (1, 10, 18, 19). In our hands, seeds obtained from Paraguay consistently exhibited viability of only 1-2%. Initial seeds obtained from Hokkaido, Japan showed a viability of only 1.3%, although later samples exhibited increased viability, up to 18.5%. The P. J. Suzuki variety consistently produces seeds having a viability in excess of 25%. Seeds produced by the P. J. Suzuki variety can be up to 85-90% viable, with viability remaining approximately 30-60% after three years of storage. Seed viability of two seed samples from Hokkaido and the P. J. Suzuki variety are presented graphically in figure 1. The consistently high seed viability of the P. J. Suzuki variety makes it feasible for domestic cultivation as a source of sweet diterpene glycosides.

Rebaudioside A Content

Previous strains of *S. rebaudiana* produced stevioside as the major sweet diterpene glycoside (2-10% of dry leaf weight; references 1, 21) with rebaudioside A as a minor component (0.23-2.9% of dry leaf weight; references 20-23). When methanol extracts of different samples of the P. J. Suzuki variety, grown over a period of three years, were analyzed by high-performance liquid chromatography (27), they were consistently found to have a rebaudioside A content in excess of 3.0% of dry leaf weight. The P. J. Suzuki variety can have a rebaudioside A content of approximately 3.7 to 6.9% of dry leaf weight,

Figure 1. Germination Rate for Different Varieties of *Stevia rebaudiana*.

and can also have a stevioside/rebaudioside A ratio of ca. 0.83-1.69. Thus, the rebaudioside A content of the P. J. Suzuki variety is ca. 27.6-2900% greater than that previously reported for *S. rebaudiana*. Since rebaudioside A is the sweetest and most pleasant tasting diterpene glycoside isolated from the plant, the advantage of the new variety is apparent. Typical high-performance liquid chromatograms of *S. rebaudiana* methanolic extracts from the Japanese and P. J. Suzuki varieties are shown in figure 2A and B, respectively, for comparison.

Frost/Flood Resistance

Wild strains of *S. rebaudiana*, e.g., plants grown from original root (Hokkaido) and stem cuttings, are very sensitive to frost and cannot survive more than short exposure (less than 2-3 hours) to temperatures below 32°F.

The P. J. Suzuki variety, however, shows marked resistance to freezing temperatures and flooding. It can survive after exposure to temperatures below 32° F. for more than 3 hours. Seven week-old P. J. Suzuki variety seedlings, obtained by direct seeding in the field, were exposed to below freezing temperatures and flooding as shown in Table 2. These plants remained submerged under 4-5 inches of ice-water for one week. The survival rate for these seedlings was approximately 85%, even though root development was poor due to plant immaturity. The data show that the P. J. Suzuki variety can survive three hours minimum daily exposure to low temperatures ranging from ca. 18° F to 31° F for at least seven to twelve days duration.

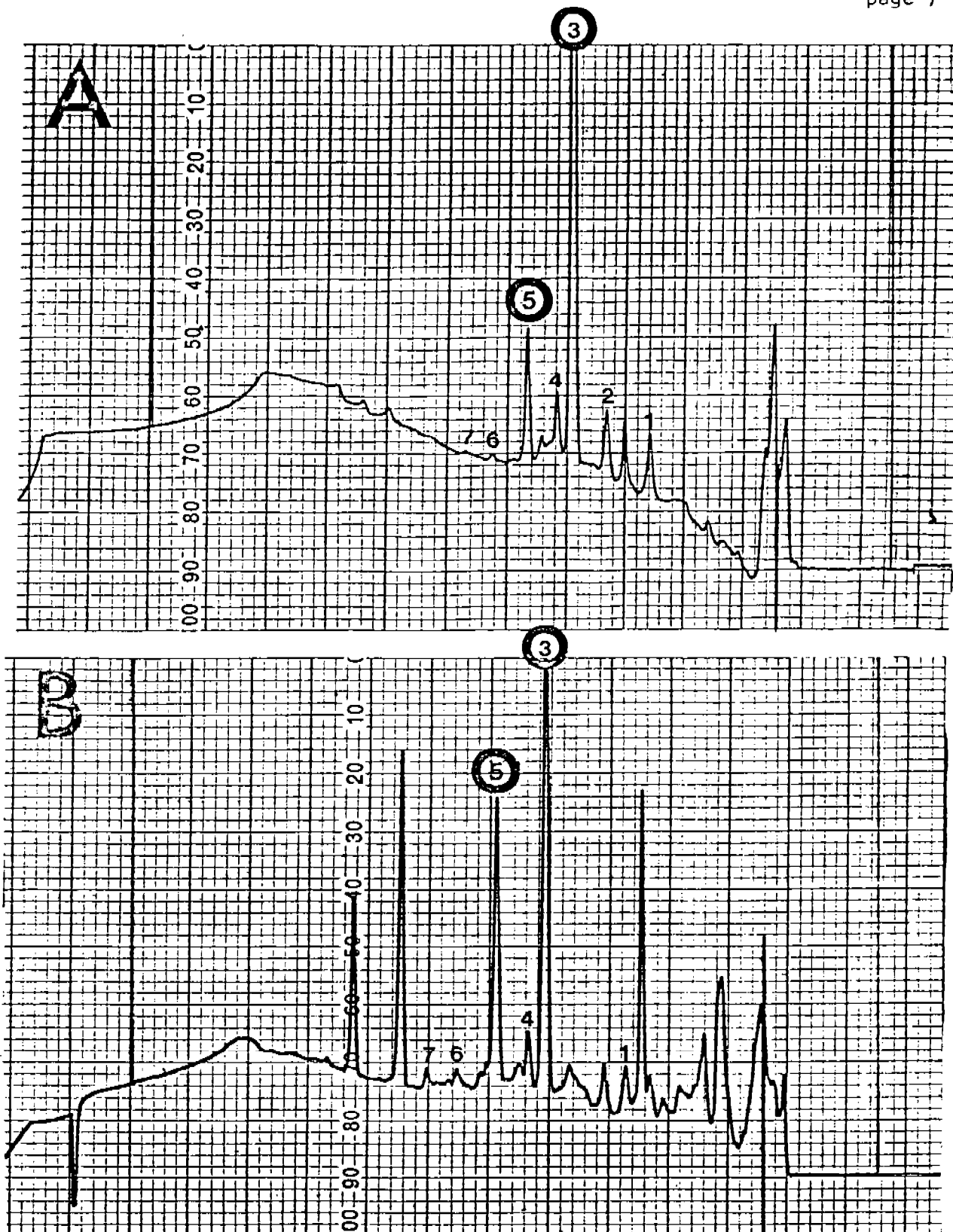


Figure 2 High-performance Liquid Chromatogram of *Stevia rebaudiana* Methanolic Extracts.

Operating conditions are a proprietary modification of those described in reference 27. A = Japanese plant variety; B = P. J. Suzuki variety. Peaks: 1 = steviolbioside; 2 = rebaudioside B; 3 = stevioside; 4 = rebaudioside C; 5 = rebaudioside A; 6 = rebaudioside E; 7 = rebaudioside D.

TABLE 2. EXPOSURE OF *STEVIA REBAUDIANA* VAR. P. J. SUZUKI TO ADVERSE ENVIRONMENTAL CONDITIONS

DATE	24-HOUR RAINFALL (INCHES)	LOW TEMPERATURE (°F) *
January 28	0	31
February 2	0	29
February 6	0	27
February 8	1.20	35
February 9	1.35	34
February 10	1.65	30
February 11	1.32	26
February 12	2.06	22
February 13	1.00	19
February 14	1.15	20
February 15	0.65	18
February 16	0.09	29
February 17	0	36

* Low temperature which was maintained for at least three hours.

FORM GR-470-24
(5-15-73)UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
GRAIN DIVISION
HYATTSVILLE, MARYLAND 20762EXHIBIT C
(Dahlia)

OBJECTIVE DESCRIPTION OF VARIETY

~~DAHLIA (DAHLIA SP.)~~ 8824 4/29/82

NAME OF APPLICANT(S) Fred K. Suzuki and Robert H. Dobberstein	FOR OFFICIAL USE ONLY PVPO NUMBER 8200065
ADORE55 (Street and No. or R.F.D. No., City, State, and ZIP Code) 746 West Algonquin Road Arlington Heights, Illinois 60005	VARIETY NAME OR TEMPORARY DESIGNATION Stevia rebaudiana Bert. var. P. J. Suzuki

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g., or) when number is either 97 or less or 9 or less.

1. PLANT: (30-90 cm) CM. HIGH CM. WIDE 1 = COMPACT 2 = SPREADING

2. MAIN STEM (At First Flower Cutting):

 1 = STRAIGHT 2 = FLEXUOUS/CROOKED Surface: 1 = NOT GLAUOUS 2 = GLAUOUS NO. OF FLOWERS PER head Surface: 1 = GLABROUS 2 = PILOSE
one to several heads per primary branch,
with 5 flowers per head (heads arranged in
loosely paniculate type of inflorescence). CM. BETWEEN PRIMARY BRANCHES - variable depending on light exposure. MM. DIAMETER AT MID-POINT OF FIRST INTERNODE ABOVE GROUND - variable, 5-20 mm. Flower to stem axis angle: 1 = $< 30^\circ$ 2 = $30^\circ - 60^\circ$ 3 = $60^\circ - 90^\circ$ {variable due to type of arrangement of heads in paniculate inflorescence.

3. LEAF:

 Type: 1 = SIMPLE 2 = PINNATE 3 = BIPINNATE NO. OF PINNAE PER LEAF Shape: 1 = LANCEOLATE 2 = OVATE 3 = ELLIPTIC 4 = lanceolate-oblong to elliptic-oblong Margin: 1 = ENTIRE 2 = DENTICULATE 3 = DENTATE 4 = LACINIATE 5 = entire at lower portion, serrate at upper portion Texture: 1 = SOFT 2 = LEATHERY 3 = chartaceous to subcoriaceous Surface: 1 = NOT GLAUOUS 2 = GLAUOUS Surface: 1 = GLABROUS 2 = PILOSE Color: 1 = GREEN 2 = DARK GREEN 3 = BRONZE (Pigmented) 4 = OTHER (Specify) green to gray-green Rachis: 1 = NOT WINGED 2 = WINGED Rachis: 1 = ROUND 2 = INVOLUTE

LEAF POSITION = OPPOSITE

4. FLOWER:

 CM. PETIOLE LENGTH BETWEEN LAST LEAVES AND FLOWER HEAD

Type: 1 = SINGLE 2 = ANEMONE 3 = COLLARETTE 4 = PEONY
5 = FORMAL DECORATIVE 6 = INFORMAL DECORATIVE 7 = BALL 8 = POMPON

 Size: 1 = TO 50 MM. 2 = 51 - 90 MM. 3 = 91 - 100 MM. 4 = 101 - 150 MM. Ray Tips: 1 = POINTED 2 = NOTCHED 3 = FIMBRIATE 4 = NO RAYS present

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20706

EXHIBIT c
(SUNFLOWER)

OBJECTIVE DESCRIPTION OF VARIETY
~~SUNFLOWER X MEXICAN HYBRID X MONSIEUR~~

Stevia rebaudiana

NAME OF APPLICANT(S) Fred K. Suzuki and Robert H. Dobberstein	VARIETY NAME OR TEMPORARY DESIGNATION P. J. Suzuki
ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code) 746 West Algonquin Road Arlington Heights, Illinois 60005	FOR OFFICIAL USE ONLY PVPO NUMBER 82 00065

Place numbers in the boxes (e.g.) for the characters that best describe typical plants of this variety. The symbol Δ indicates decimal.

COMPARISON VARIETIES

NON-OIL: 1 = ARROWHEAD 2 = MINGREN 3 = SUNDAK NA
OIL: 4 = PEREDOVIK 5 = KRASNODARETS - 6 = OTHER _____

1. CLASS:

1 = OIL TYPE 2 = NON-OIL TYPE (confectionery/)

2. MATURITY: SEE FOOTNOTE A

<input type="text" value="1"/> <input type="text" value="6"/> <input type="text" value="5"/> NO. OF DAYS TO HEAD FIRST VISIBLE (from emergence)	<input type="text" value="2"/> <input type="text" value="2"/> <input type="text" value="5"/> NO. OF DAYS TO HARVEST RIPENESS (from emergence)
<input type="text" value="N"/> <input type="text" value="A"/> DAYS EARLIER THAN	<input type="text" value="N"/> <input type="text" value="A"/> DAYS EARLIER THAN
HEADING SAME AS	MATURITY SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> DAYS LATER THAN	<input type="text" value="N"/> <input type="text" value="A"/> DAYS LATER THAN
<div style="display: flex; justify-content: space-around;"> <div> <p>c I } COMPARISON VARIETY</p> <p>c I }</p> <p>a }</p> </div> <div> <p>c I } COMPARISON VARIETY</p> <p>c I }</p> <p>c I }</p> </div> </div>	

3. HEIGHT: SEE FOOTNOTE B

<input type="text" value="7"/> <input type="text" value="5"/> cm TALL AT HARVEST RIPENESS	<input type="text" value="N"/> <input type="text" value="A"/> cm SHORTER THAN
	SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> cm TALLER THAN	
<div style="display: flex; justify-content: space-around;"> <div> <p>c I } COMPARISON VARIETY</p> <p>c I }</p> <p>c I }</p> </div> <div> <p>c I } COMPARISON VARIETY</p> <p>c I }</p> <p>c I }</p> </div> </div>	

4. STEM:

<input type="text" value="N"/> <input type="text" value="A"/> LENGTH OF INTERNODE AT HARVEST RIPENESS	<input type="text" value="N"/> <input type="text" value="A"/> NUMBER OF LEAVES
<input type="text" value="N"/> <input type="text" value="A"/> CM. SHORTER THAN	<input type="text" value="N"/> <input type="text" value="A"/> FEWER LEAVES THAN
SAME AS	SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> CM. LONGER THAN	<input type="text" value="N"/> <input type="text" value="A"/> MORE LEAVES THAN
<div style="display: flex; justify-content: space-around;"> <div> <p>c I } COMPARISON VARIETY</p> <p>a }</p> <p>a }</p> </div> <div> <p>c I } COMPARISON VARIETY</p> <p>c I }</p> <p>c I }</p> </div> </div>	
<p>a BRANCHING: 1 = NO BRANCHING 2 = BASAL BRANCHING, 3 = TOP BRANCHING (with central head) 4 = FULLY BRANCHED (without central head)</p>	

COLOR OF GROWING POINT: 1 = GREEN 2 = YELLOW

ADDITIONAL DESCRIPTION OF THE VARIETY

From: Robinson, B. L. 1931. The Stevias of Paraguay. Con-t. Gray Herb. 90: 87.

"*S. rebaudiana* (Ber ton i) Hems 1. Suffruticose, erect, obscurely puberulent, 3-4.5 dm. high; leaves opposite, sessile, lance-oblong to spatulate-oblong-eolate, obtuse, serrate above the middle, entire on the cunately narrowed base, of chartaceous or subcoriaceous texture, 3-nerved and conspicuously veiny, the cauline 3-5 cm. long, 7-15 mm. wide, often proliferous in axils; inflorescence becoming rather loosely paniculate, the heads (on pedicels often about as long as the involucre) appearing opposite the bracts in irregular sympodial cymes; corollas with pale purple throat and white limb; achenes nearly uniform, 15-17 aristate. -- Hemsl. in Hook. Ic. Pl. xxix. pl. 2816 (1906); Turrill, Kew Bull. 1918, p. 343-345 (1918). *Eupatorium Rebaudianum* Bertoni, Bol. Escuel. Agric. Asunc. ii. 35 (1899).

Northern Paraguay: highlands of Amarobay and northward to the sources of the Rio Monday, Bertoni, *Gosling* (G r .) .

This is the 'Sweet Herb of Paraguay.' Its leaves, even after drying, possess a singularly lasting sweet taste. The plant in consequence has been the subject of experimental cultures at Kew, at the Agricultural Station in Barbados, the Harvard Botanic Garden in Cuba, and doubtless at many other places. Although it is said to be quite free from noxious effects, no satisfactory methods have thus far been devised for its use as a sweetening agent in foods, preserves, etc. The plant, however, sti 11 remains a promising subject for further research and experimentation along these lines."

COMMENT BY APPLICANTS:

Stevia rebaudiana has plastic morphological characteristics. It has fibrous roots, usually white when young, becoming brown because of a cork layer.

The flower heads are homocarpic. The corolla is salverform (phlox-type) with five lobes. Figures 3 and 4 show line drawings and photographs of *Stevia rebaudiana* Bert. var. P. J. Suzuki.



April 7, 1982

Mr. Joseph J. Higgins
Examiner, Plant Variety
Protection Office
U.S. Department of Agriculture
Livestock, Poultry, Grain & Seed Division
National Agricultural Library Building
Beltsville, Maryland 20705

RE: Stevia Application No. 8200065, "P. J. Suzuki"

Dear Mr. Higgins:

This is in response to the questions raised in your letter of February 23, 1982.

You are correct in assuming that the selections resulting in the P. J. Suzuki variety were largely based on survival at low temperatures. The increase in germination might be attributed to the crossing of plants from two different sources and/or to the low temperature selection process. The only plants retained were those which survived the low temperature treatment. These plants which survived the low temperature treatment exhibited all of the novel characteristics claimed for the P. J. Suzuki variety, i.e., these same plants produce seed with a higher germination rate, leaves with a higher rebaudioside A content, and show increased frost/flood resistance.

- As shown in Exhibit A, page 3, plants grown in the field were obtained from two sources:

1. Plants produced by root division and stem cuttings from S. rebaudiana obtained from Hokkaido, Japan.
2. Plants grown from a second lot of seed of S. rebaudiana also obtained from Hokkaido, Japan and possessing a viability of approximately 18.5%.

Since plants from both sources were planted in the same field, some cross-pollination of the two plant sources undoubtedly occurred. All of the seed produced by the field plants was germinated (Exhibit A, page 2, paragraph 2). Only 47-53% of the seed was viable under the germination conditions used, which were selected to produce the highest rate of germination possible. When the resulting plantlets were approximately two-weeks-old, they were subjected to the selection conditions described in Exhibit A, page 2, paragraph 2.

The surviving plants (42%) are-used as the continued seed source for the P. J. Suzuki variety. It was determined that the variety had been sexually reproduced with the recognized characteristics on March 17, 1980. A decision was made to increase the seed on this same date. The variety was named P. J. Suzuki on November 3, 1981. In the interim, the variety was designated as "PJS-1".

S. rebaudiana variety P. J. Suzuki has been examined through three successive sexual reproductive generations. No changes in **morphological** characteristics, seed viability, rebaudioside A content, frost/flood resistance, or other measurable characteristics were observed. Thus the variety has been shown to be stable.

Our use of the term "other varieties" of S. rebaudiana in Exhibit B was perhaps misleading. To the best of our knowledge, **no** discrete strains or varieties of S. rebaudiana have been previously identified. We used the term "other varieties" to indicate S. rebaudiana plants which have previously been described in the literature, **which** are presumably wild types.

Novel characteristics of the P. J. Suzuki variety are as follows:

<u>CHARACTERISTIC</u>	<u>S. rebaudiana</u> <u>Wild Type</u>	<u>S. rebaudiana</u> <u>Var. P. J. Suzuki</u>
Seed viability	1-2%	85-90%
Rebaudioside A content (% dry weight of leaves)	0.23-2.9%	3.7-6.9%
Frost resistance (Survival temperature/ times)	Less than 2-3 hours. at 32°F or below for 1 day.	More than 2-3 hours. at 18-31°F for at least 7-12 days.

We consider the normal germination rate for P. J. Suzuki variety seeds to be approximately 87%. When the "wild type" seed is germinated under identical conditions the viability rate is approximately 1.5%. The data shown in Figure 1 for Hokkaido sample number 1 is representative of the wild type as described in the literature. Although Hokkaido sample number 2 does not represent a named variety, the germination rate for this seed (approximately 18.5%) is significantly higher than that previously reported in the literature,

Previous "strains" of S. rebaudiana, i.e., plants previously reported in the literature, produce 0.23-2.9% rebaudioside A, whereas P. J. Suzuki variety produces 3.7-6.9% rebaudioside A. This represents a difference of 27.6% $\left(\frac{3.7-2.9}{2.9} \times 100 \right)$ to 2,900% $\left(\frac{6.9-0.23}{0.23} \times 100 \right)$ and is surely significant. Reference 27 was cited to illustrate the methodology used for high-performance liquid chromatographic analyses. The results of the analyses described in this reference were for "wild type" plants, not the P. J. Suzuki variety. For comparative purposes, the diterpene glycoside content of S. rebaudiana previously reported in the literature ("wild type") and P. J. Suzuki are as follows:

4. FLOWER (Continued):

☐ N ☐ A Ray Color: *select from colors below. Consider only the predominant colors on the face of the rays except for those pompon or ball inflorescences in which the reverse of the involute rays dominate. (See References below.)*

☐ N ☐ A MONOCOLOR *Select from colors below.*

Pattern:

☐

GROUND COLOR

☐

DOT

☐

FLECK

☐

SPLASH

☐

NARROW LINE

☐

PICOTEE

☐

OTHER (Specify)

NOT APPLICABLE

Disc Flower:

2

1 = ABSENT 2 = PRESENT

a

☐

PRIMARY COLOR

☐SECONDARY COLOR = corolla throat usually pur
M - C - - - - - pink

01 = WHITE

02 = YELLOW

03 = ORANGE

04 = PINK

05 = DARK PINK

06 = RED

07 = DARK RED

08 = LAVENDER

09 = PURPLE

10 = BRONZE

11 = FLAME

12 = LIGHT BLEND

13 = DARK BLEND

14 = OTHER (Specify)

5. DISEASE RESISTANCE (0 = Not Tested; 1 = Susceptible; 2 = Resistant)

c 0 MOSAIC

c 0 RINGSPOT

☐

OTHER (Specify)

6. INSECT RESISTANCE (0 = Not Tested; 1 = Susceptible; 2 = Resistant)

☐

APHID

☐

THRIP

☐

BORER

☐

OTHER (Specify)

7. INDICATE A VARIETY THAT MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	SPECIE XXXXXX	CHARACTER	SPECIE XXXXXX
Plant size	<i>Stevia ammotropha</i> Robinson	Flower size	UNKNOWN
Plant habit	<i>Stevia amambayensis</i> Robinson	Flower shape	<i>Stevia entreriensis</i> Hieron.
Leaf shape	<i>Stevia ammotropha</i>	Flower color	<i>Stevia entreriensis</i>

REFERENCES

RAY COLOR: Described in the 1971 Classification of Dahlias compiled and published by the Joint Classification Committee sponsored jointly by the American Dahlia Society, Inc. and the Central States Dahlia Society, Inc.

American Dahlia Society. Current Series. Classification of Dahlias.

Barnes, A.T., 1966. The Dahlia Grower's Treasury. Collingridge, London.

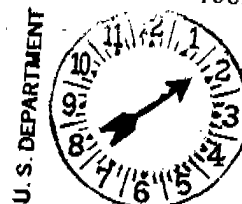
Cook, W. H., 1953. Judging Dahlias in Shows. Amer. Dahlia Society

U.S.D.A. Home and Garden Bul. 131, 1970. Growing Dahlias.

COMMENTS:

RECEIVED

FEB 2 1982

AMS, LPG&S DIV.
PVPO

15

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(SUNFLOWER)

OBJECTIVE DESCRIPTION OF VARIETY
~~SUNFLOWER X HELIXANTHUS ANNUUS X~~

Stevia rebaudiana

NAME OF APPLICANT(S) Fred K. Suzuki and Robert H. Dobberstein	VARIETY NAME OR TEMPORARY DESIGNATION P. J. Suzuki
ADDRESS (Street and No., or R.F.D. No., City, State, and ZIP Code) 746 West Algonquin Road Arlington Heights, Illinois 60005	FOR OFFICIAL USE ONLY PVPO NUMBER 82 000 65

Place numbers in the boxes (e.g.) for the characters that best describe typical plants of this variety. The symbol Δ indicates decimal.

COMPARISON VARIETIES

NON-OIL: 1 = ARROWHEAD 2 = MINGREN 3 = SUNDAK NA
OIL: 4 = PEREDOVIK 5 = KRASNODARETS 6 = OTHER

1. CLASS:

1 = OIL TYPE 2 = NON-OIL TYPE (confectionery)

2. MATURITY: SEE FOOTNOTE A

<input type="text" value="1"/> <input type="text" value="6"/> <input type="text" value="5"/> ND. OF DAYS TO HEAD FIRST VISIBLE (from emergence)	<input type="text" value="2"/> <input type="text" value="2"/> <input type="text" value="5"/> NO. OF DAYS TO HARVEST RIPENESS (from emergence)
<input type="text" value="N"/> <input type="text" value="A"/> <input type="text" value="A"/> DAYS EARLIER THAN	<input type="text" value="N"/> <input type="text" value="A"/> DAYS EARLIER THAN
HEADING SAME AS	MATURITY SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> <input type="text" value="A"/> DAYS LATER THAN	<input type="text" value="N"/> <input type="text" value="A"/> <input type="text" value="A"/> DAYS LATER THAN

COMPARISON VARIETY

3. HEIGHT: SEE FOOTNOTE B

<input type="text" value="7"/> <input type="text" value="5"/> cm TALL AT HARVEST RIPENESS	<input type="text" value="N"/> <input type="text" value="A"/> cm SHORTER THAN
SAME AS	SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> cm TALLER THAN	<input type="text" value="N"/> <input type="text" value="A"/> cm TALLER THAN

COMPARISON VARIETY

4. STEM:

<input type="text" value="1"/> <input type="text" value="N"/> <input type="text" value="A"/> LENGTH OF INTERNODE AT HARVEST RIPENESS	<input type="text" value="N"/> <input type="text" value="A"/> <input type="text" value="A"/> NUMBER OF LEAVES
<input type="text" value="N"/> <input type="text" value="A"/> CM. SHORTER THAN	<input type="text" value="N"/> <input type="text" value="A"/> FEWER LEAVES THAN
SAME AS	SAME AS
<input type="text" value="N"/> <input type="text" value="A"/> CM, LONGER THAN	<input type="text" value="N"/> <input type="text" value="A"/> MORE LEAVES THAN

COMPARISON VARIETY

BRANCHING: 1 = NO BRANCHING 2 = BASAL BRANCHING
3 = TOP BRANCHING (with central head) 4 = FULLY BRANCHED (without central head)

COLOR OF GROWING POINT: 1 = GREEN 2 = YELLOW

5. LEAVES (Midstem at flowering):

 5 7 CM. BLADE LENGTH SEE FOOTNOTE A 2 7 CM. BLADE WIDTH SEE FOOTNOTE A N A CM. SHORTER THAN N A CM. NARROWER THAN

LENGTH SAME AS

WIDTH SAME AS

COMPARISON
VARIETYCOMPARISON
VARIETY N A CM. LONGER THAN N A CM. WIDER THAN 1 WIDTH: LENGTH RATIO: 1 = NARROWER THAN LONG 2 = EQUAL 3 = WIDER THAN LONG 2 LEAF SHAPE: 1 = CORDATE 2 = OTHER = lanceolate-oblong to elliptic-oblong 2 LEAF APEX: 1 = ACUMINATE 2 = OTHER obtuse 3 LEAF BASE: 1 = AURICULATE 2 = TRUNCATE 3 = cuneately narrowed 4 LEAF MARGIN: 1 = ENTIRE 2 = FINELY CRENATE 3 = COARSELY CRENATE 4 = OTHER = entire at lower portion, serrate at upper portion

cl 1 DEPTH OF MARGIN INDENTATIONS: 1 = SHALLOW 2 = INTERMEDIATE 3 = DEEP

EI 2 ATTITUDE: 1 = ERECT 2 = ASCENDING 3 = HORIZONTAL 4 = DESCENDING

cl 1 SURFACE: 1 = SMOOTH 2 = CRINKLED (ridged) 3 = OTHER

 5 COLOR: 1 = LIGHT GREEN 2 = GREEN 3 = DARK GREEN 4 = BROWN 5 = green to gray-green 3 MARGIN COLOR: 1 = GREEN 2 = YELLOW 3 = green to gray-green

6. HEAD AT FLOWERING:

 1 RAY FLOWERS: 1 = ABSENT 2 = PRESENT N A RAY FLOWER COLOR: 1 = YELLOW 2 = SULFUR YELLOW 3 = ORANGE YELLOW 4 = OTHER 4 DISK FLOWER COLOR: 1 = YELLOW 2 = RED 3 = PURPLE 4 = white, usually with purplish corolla throat 1 ANTHOCYANIN IN STIGMAS: 1 = ABSENT 2 = PRESENT 1 POLLEN COLOR: 1 = WHITE (colorless) 2 = YELLOW. 3 PAPPI: 1 = GREEN 2 = RUST (red) 3 = white, becoming straw-colored as achene matures N A MM. RAY LENGTH N A MM. RAY WIDTH N A MM. SHORTER THAN N A MM. NARROWER THAN

SAME AS

SAME AS

COMPARISON
VARIETYCOMPARISON
VARIETY N A MM. LONGER THAN N A MM. WIDER THAN

7. HEAD AT SEED MATURITY:

 0 5

CM. DIAMETER

 N A

CM. NARROWER THAN

SAME AS

 N A

CM. WIDER THAN

 1

RECEPTACLE SHAPE: 1 = FLAT 2 = CONVEX 3 = CONCAVE

a 1 HEAD ATTITUDE: 1 = VERTICAL (*erect*) 2 = ASCENDING 3 HORIZONTAL 4 = DESCENDING
 5 1

NO. OF SEEDS PER HEAD

 N A

SEEDS / HEAD LESS THAN

SEEDS / HEAD SAME AS

 N A

SEEDS / HEAD MORE THAN

COMPARISON VARIETY

COMPARISON VARIETY

8. SEEDS:

 4

OUTER PERICARP: 1 = CLEAR 2 = STRIPED BLACK 3 = NEARLY SOLID BLACK 4 = usually dark brown with light brown longitudinal nerves

 3

MIDDLE PERICARP: 1 = WHITE 2 = SOLID PURPLE 3 = dark brown

 3
INNER PERICARP (*seed coat*): 1 = NO COLOR 2 = BROWNISH BLACK 3 = white
 5

STRIPES: 1 = ABSENT 2 = EVEN BLACK & WHITE STRIPES 3 = BROAD BLACK & NARROW WHITE

4 = BLACK WITH NARROW DARK-GREY STRIPING 5 = OTHER lighter brown longitudinal stripes or nerves

 1

MOTTLING: 1 = ABSENT 2 = PRESENT

 6
SHAPE: 1 = OVATE 2 = OBOVATE (*shield*) 3 = NARROWLY OBOVATE 4 = OBLONG 5 = ELLIPTIC 6 = oblong-acicular with somewhat narrowed base
 2
SHAPE (*cross-section*): 1 = NOT CURVED 2 = CURVED
 3 0

MM. LENGTH

 0 4

GM. / 100 SEED 0.04 gm/100 seeds

 N A

MM. SHORTER THAN

SAME AS

 N A

MM. LONGER THAN

 N A

GM. LIGHTER THAN

SAME AS

 N A

GM. HEAVIER THAN

 N A

% HELD ON 7.9 MM. (20/64) ROUND-HOLE SCREEN

 N A

% LESS THAN

SAME AS

 N A

% MORE THAN

COMPARISON VARIETY

COMPARISON VARIETY

COMPARISON VARIETY

9. DISEASE AND INSECTS (0 = Not tested, 1 = Susceptible, 2 = Resistant):

☒ RUST (*Puccinia helianthi*)

GIVE RACES: _____

☒ VERTICILLIUM WILT (*Verticillium dahliae*)☒ DOWNY MILDEW (*Plasmopara halstedii*)☒ WHITE BLISTER RUST (*Albugo tragopogii*)☒ BROOM RAPE (*Orobancha cannis*)

GIVE RACES: _____

☒ EUROPEAN SUNFLOWER MOTH (*H. nebullosa*)☒ OTHER (specify) _____☒ SCLEROTI NIA WILT (*Sclerotinia sclerotiorum*)☒ LEAF MOTTLE IV. *albo-strum*☒ GRAY-MOLD BLIGHT, BUD ROT (*Botrytis cinerea*)☒ CHARCOAL ROT, STEM ROT (*Macrophomina phaseolina*)☒ SUNFLOWER MOTH, N. AMERICAN HEAD MOTH
(*Homoeosoma electellum*)☐ OTHER (specify) _____☐ OTHER (specify) _____

10. GIVE VARIETY OR **VARIETIES THAT MOST CLOSELY RESEMBLE** THE SUBMITTED VARIETY, For the following characteristics indicate degree of **resemblance** by placing in the column marked **D.R.**, one of the following numbers:
 1 = Submitted variety is less, lighter or inferior than comparison variety 2 = Same as 3 = More than, darker, or superior NOT APPLICABLE

CHARACTER	VARIETY	D.R.	CHARACTER	VARIETY	D.R.
Frost resistance			Leaf attitude		2
Lodging resistance			Head attitude		2
Neck or stem strength			Ray flower color		
Branching type		2	Seed shape		2
Petiole length			Seed color		
Leaf shape		2	Seed striping pattern		2
Leaf color (green)			Seed yield		

11. GIVE THE FOLLOWING DATA FOR SUBMITTED AND A **SIMILAR** VARIETY*. --NOT APPLICABLE

VARIETY	HULL (%)	PROTEIN (%)	OIL (%)	IODINE NO.	FATTY ACIDS	
					OLEIC (%)	LINOLEIC (%)
Submitted						
Similar						
Name of similar variety						

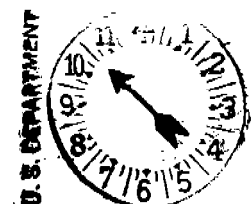
* Hull, protein and oil percentages expressed for whole undecorticated seed; acids expressed as percentages of oil

12. COMMENTS:

Stevia rebaudiana var. P. J. Suzuki, like the *S. rebaudiana* "wild type", is a perennial in mild climates. It is a short day plant with somewhat plastic morphological characteristics highly dependent on plant age, day length, and light intensity, as is the "wild type".

RECEIVED

APR 20 1982

AMS, LPGS DIV.
PVPO